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DEVICE FOR MANUFACTURING FROZEN BLOCK FOODS
[Katamarijou reishokuhin no seizou souchi]

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Specification /303*

1. Title of the Invention

Device for Manufacturing Frozen Block Foods

2. Claim

A device for manufacturing frozen block foods equipped with: a pair of die rolls, 10 and 11, which are provided on their outer peripheries with one or more mutually corresponding pairs of depressions, 17 and 18, that are rotated at the same speed; raised sliding surfaces 26a which almost come into contact with the outer peripheries of the areas of the depressions, 17 and 18, that are located above the contact area of the pair of die rolls, 10 and 11; a filling plate 26 equipped with grooves 26b, which are depressions in the inner sides of the raised sliding surfaces 26a, and filling holes 29 that penetrate from a food supplying means to the grooves 26b; and a suctioning plate 27 equipped with suctioning holes 31 that penetrate from an excess food suctioning means to locations slightly below the lower ends of the raised sliding surfaces 26a.

3. Detailed Description of the Invention

Field of the Invention

The present invention relates to a device for manufacturing frozen block foods. In this specification, the term, frozen foods, refers to all food articles which can be solidified into blocks by means of cooling, such as butter and frozen desserts including ice candies and ice creams.

Related Art and Problems Thereof

The following is known an example of a device for manufacturing block

* Numbers in the margin indicate pagination in the foreign text.

chocolates having the shapes of flattened spheres. This device is equipped with a pair of die rolls which are arranged horizontally without a gap between them, which have multiple mutually corresponding depressions on their outer peripheries, and which are rotated in a manner such that, in the contact area (According to this specification, the contact area refers to the area in which the pair of die rolls are the closest to each other or in contact with each other.), the depressions face one /304
another and move downward at the same speed, and is also equipped with a filling device for filling chocolate in the depressions of the die rolls while located above the contact area of the pair of die rolls. A fluid (brine) for cooling the die rolls is supplied to the interiors of the two die rolls. In the case of chocolate, it shrinks when cooled down and becomes likely to peel off of the walls of the depressions. For this reason, the chocolate filled in the depressions of the die rolls become connected to each other when the corresponding depressions pass through the contact area and then become separated easily from the depressions and fall off because of gravity when the depressions move downward from the contact area and thus become mutually separated. However, ice candies will become likely to attach to the walls of the depressions when cooled and therefore cannot be obtained from the above manufacturing device without alteration. In other words, in the case of the above manufacturing device, food articles are simply filled inside the depressions up to approximately the same surface levels as the outer periphery levels of the die rolls. Therefore, the food pieces will be compressed against each other with a relatively weak force, not with a strong force, when the depressions of both sides

pass through the contact area. Since ice candies tend to attach to the walls of the depressions as mentioned in the above, the ice candies that became united when the corresponding depressions passed the contact area will remain attached to the walls of the depressions of both die rolls, and when the depressions became separated from each other while moving downward from the contact area, some of the ice candies that became connected become separated into two pieces and remain in both depressions. Therefore, it is difficult to achieve reliable formation of blocks of ice candies when the above manufacturing device is utilized without alteration.

The purpose of the invention is to solve the above problem and to provide a manufacturing device that can be applied also to ice candies.

Means for Solving the Problem

A manufacturing device of the invention for frozen block foods comprises: a pair of die rolls equipped with pairs of mutually corresponding depressions on the outer peripheries, one or more of the pairs being rotated at the same speed; raised sliding surfaces which almost contact the outer peripheries of the depressions in areas of the pair of die rolls above the contact area; filling plates equipped with grooves, which are the depressions on the inner sides of the raised sliding surfaces, and filling holes which penetrate from a food supplying means to the grooves; and suction plates provided with suction holes that penetrate from an excess food suctioning means to locations slightly below the lower ends of the raised sliding surfaces.

Operation of the Invention

Food pieces filled in the depressions of the pair of die rolls become connected together and formed as blocks when the corresponding depressions pass through the contact area. At this time, the food pieces filled in the depressions become mutually compressed with a strong force and become connected reliably when the depressions pass through the contact area since the portions filled in the grooves in the inner sides of the raised sliding surfaces are raised outward from the outer periphery levels of the die rolls. In addition, the food pieces that became excess at this time become suctioned from the suction holes by means of the suctioning means to be discharged.

Embodiment of the Invention

The accompanying drawings illustrate one example of a manufacturing device for spherical ice candies. This device is equipped with a pair of die rolls, 10 and 11, which are positioned horizontally without a gap between them and is also equipped with a filling device 12 that is located above the contact area of the die rolls.

The two rolls, 10 and 11, are hollow and have multiple, mutually corresponding hemispherical depressions, 17 and 18, on their outer /305
peripheries at equal intervals and in the circumferential direction. Moreover, the diameters of the depressions, 17 and 18, of the rolls, 10 and 11, are mutually equal. The first roll 10 is fixated to a rotating shaft 19, which is connected to a suitable driving device not shown. The second roll 11 is supported rotatably by a fixed shaft 20, which is in parallel to the rotating shaft 19, and is connected to the rotating shaft

19 by an appropriate means, such as a gear. The two rolls, 10 and 11, are rotated at a constant speed in the direction of the arrows in the drawing in a manner such that the positions of the depressions, 17 and 18, match in the contact area and then move downward at the same speed.

The ends of the first roll 10 are sealed by an appropriate means, and the interior of the roll 10 is continually fed with a roll heating fluid 21, which is warm water that causes the ice candies to melt slightly. As the roll heating fluid 21, it is also possible to use a heated fluid, such as oil, or heated gas, such as air, instead of warm water.

The fixed shaft 20 inside the second roll 1 has multiple circular rings 22 fixated to it, and the outer peripheries of these circular rings 22 have a single cylinder 23, which is parallel to the fixed shaft 20, fixated to them. This cylinder 23 is located in an area below the fixed shaft 20 and slightly closer to the first roll 10, and part of the cylinder 23 is protruding a little from the outer peripheries of the circular rings 22. These circular rings 22 and cylinder 23 make up a cam of sorts, although it is possible to omit the cylinder 23 by providing the circular rings 22 with cylindrical protrusions in the location of the cylinder 23 in which the circular rings 22 and cylinder 23 are intended to be united. The bottom parts of the depressions 18 of the second roll 11 are provided with multiple guiding holes 24 that radially penetrate the wall surfaces of the roll 11, and each of the holes 24 has a rod 25 fitted to it in an axially slidable manner.

The inner end of each rod is provided with an integrated head part 25a that has a diameter larger than the rest, and the end face of the

head part 25a has a spherical shape. Moreover, the outer end of each of the rods 25 has a concaved spherical surface that matches the shape of the bottom of the corresponding depression 18. Both ends of the second roll 11 are sealed by appropriate means, and the airtight space inside the roll 11 is connected to a vacuum pump not illustrated. Moreover, by reducing the pressure inside the roll 11, each rod 25 is always suctioned inward, and their head parts 25a are in contact with the outer peripheries of the circular rings 22 or cylinder 23. When a rod 25 is in contact with the circular rings 22, it retreats from the depression 18 toward the roll 11, and its outer end matches the bottom part of the depression 18. When it is in contact with the cylinder 23, it protrudes into the depression 18 from the bottom part of the depression 18.

The filling device 12 comprises multiple filling plates 26 and suctioning plates 27. The filling plates 26 and suctioning plates 27 are alternately layered in the axial direction of the rolls, 10 and 11, in a manner such that the former are located above the rolls, 10 and 11, and the latter are located on either side of the rolls, 10 and 11, and they are fixated in an integrated manner by an appropriate means. On either side of the bottoms of the filling plate 26, there are raised sliding surfaces 26a, which are shaped in a manner such that they can be in contact with the two rolls, 10 and 11, at all times, and grooves 26b, which are provided on the inner sides of the raised sliding surfaces. Both surfaces of the lower part of each of the suctioning plates 27 are wider than the filling plates 26 so that they completely cover the contact surfaces between the rolls, 10 and 11, and raised sliding surfaces 26a. The lower

ends of the filling plates 26 reach the area slightly above the /306
contact area of the two rolls, 10 and 11, and the widths of their grooves 26b are roughly equal to or slightly greater than the diameters of the depressions, 17 and 18. Each filling plate 26 is provided with a filling hole 29 which extends downward from the center of the upper surface, then diverges in two directions, and then opens up in the middle parts of the grooves 26b. Moreover, in the areas near the sides of each of the filling plates 26, there is the formation of a suctioning hole 30 that reaches from the top face of the plate to the top of the grooves 26b. The lower ends of the suctioning plates 27 are longer than the lower ends of the filling plates 26 and reach the level of the contact area of the rolls, 10 and 11, or a level slightly below that. Each suctioning plate 27 is provided with a suctioning hole 31 that extends downward from the center of the top face of the plate and that then, in the area slightly below the lower end of the filling plate 26 and above the contact area, stretches in the axial direction of the rolls, 10 and 11, to open up on both sides. In addition, although omitted in the drawings, when the rolls, 10 and 11, and many suctioning plates 27 are alternately layered, the lower end of the suctioning hole 31 of the suctioning plate 27 on either end of the layered structure only opens up to the filling plate 26 side. The upper end of the filling hole 29 is connected to an ice candy supply device, and the upper ends of the suctioning holes, 30 and 31, are connected to an ice candy suctioning pump.

In the above-mentioned manufacturing device, ice candy A that is, for example, between -7 and -6°C is continuously supplied from the ice

candy supply device to each of the filling holes 29 of the filling device 12. From the lower-end opening of the filling hole 29, this ice candy A becomes filled into the depressions, 17 and 18, of the rolls, 10 and 11, that moved to the location of the hole. At this time, the air that existed inside the depressions, 17 and 18, is discharged upward through the grooves 26b of the charging plate 26, and as a result, no air will remain in the depressions, 17 and 18. Moreover, since the rods 25 of the second roll 11 stretch inside the roll from the bottom parts of the depressions 18 and are in contact with the circular rings 22, the ice candy A becomes filled in the entire depressions 18 in the shapes of hemispheres. Moreover, the ice candy A will be filled not only in the depressions, 17 and 18, but also in the grooves 26b. The ice candy A that became filled in the corresponding depressions, 17 and 18, becomes united when the depressions, 17 and 18, pass the contact area and becomes a spherical ice candy product B. At this time, since the ice candy halves A in the depressions, 17 and 18, are raised outward, they come into contact with a strong force and thus become united completely. After the ice candy halves A are united together, the excess ice candy A becomes suctioned from the suctioning holes 31 of the suctioning plate 27 to be discharged. This eliminates the possibility of the excess ice candy A forming fin-like projections around the connecting portion of the product B. Moreover, even if the ice candy A moves to an upper part of the grooves 26b of the filling plate 26, it becomes suctioned from the suctioning hole 30 of the filling plate 26 to be discharged. Therefore, the grooves 26b will not become clogged and prevent air from being released. Although the first

roll 10 is cooled down by the ice candy A, it is also heated by a heating fluid 21, which heats up the area of the ice candy A that contacts the walls of the depression 17. Therefore, the ice candy A is unlikely to attach to the walls of the depression 17. Therefore, the product B will always attach to the walls of the depression 18 of the second roll /307 11. Moreover, the type, flow quantity, and temperature of the roll heating fluid 21 can be determined appropriately so that the product B will come off of the walls of the depression 17 easily and so that the roll 10 will not be too hot. The spherically shaped product B becomes attached to the walls of the depression 18 of the second roll 11 and moves downward as the roll 11 is rotated. By the rod 25 coming into contact with the cylinder 23 and being pushed into the depression 18, the product B becomes pushed and discharged from the depression 18 and then falls off because of gravity. Moreover, the second roll 1 is also cooled down by the ice candy A, and if the temperature becomes too low, it becomes difficult for the product B to become separated. Therefore, it is kept at a suitable temperature a heater (not shown in the drawings) provided in an appropriate area.

The structures of the components of the die rolls, 10 and 11, and filling device 12 and the product discharging means are not restricted to those mentioned in the above embodiment, and various modifications are permitted. For example, the filling device 12 may have an integrated structure. The rod 25 may be reciprocated by means of fluid pressure as in air cylinder. Also, it is possible to discharge the product directly from the depression 18 by means of air pressure or the like.

Needless to say, the manufacturing device of this invention can also be applied to frozen block food articles other than ice candies. The shapes of the products are not limited to spheres, either.

Effect of the Invention

Because of the above-described structure, the device of the invention for manufacturing frozen block food articles can be applied to ice candies as well as others, and it can securely unite ice candy halves together by causing them, which are filled in the depressions of a pair of die rolls, to come into contact with each other with a strong force.

4. Brief Description of the Drawings

The accompanying drawings illustrate the embodiment of the invention. Figure 1 is a horizontal cross-sectional drawing showing a pair of die rolls that have been sectioned at the area of a filling plate of the filling device. Figure 2 is a horizontal cross-sectional drawing showing a pair of die rolls that have been sectioned at the area of a suctioning plate of the filling device. Figure 3 is a side-view drawing showing the device from the right side of Figure 1 with the second die roll removed.

10, 11 = die roll; 12 = filling device; 17, 18 = depression; 26a = raised sliding surface; 26b = groove; 29 = filling hole; 31 = suctioning hole; A = ice candy; B = ice candy product.

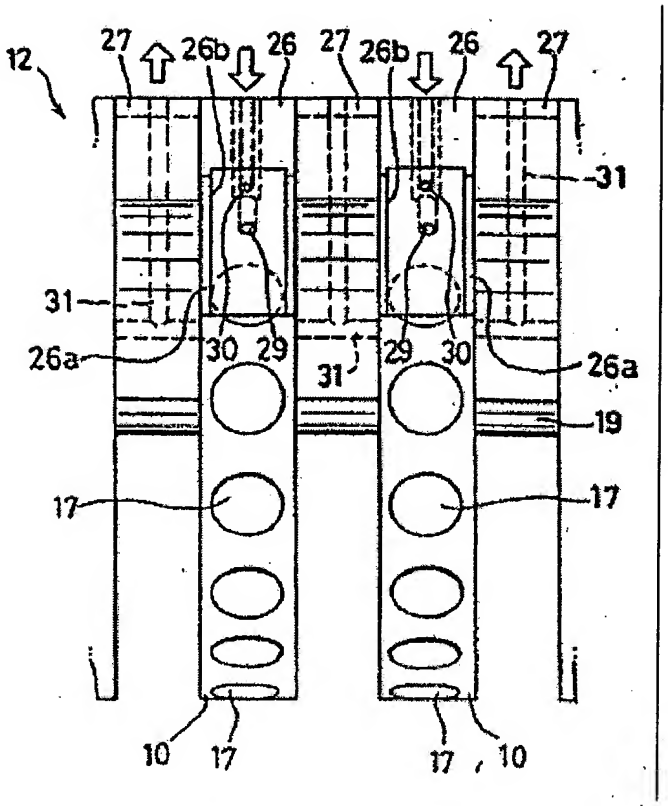
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Figure 3

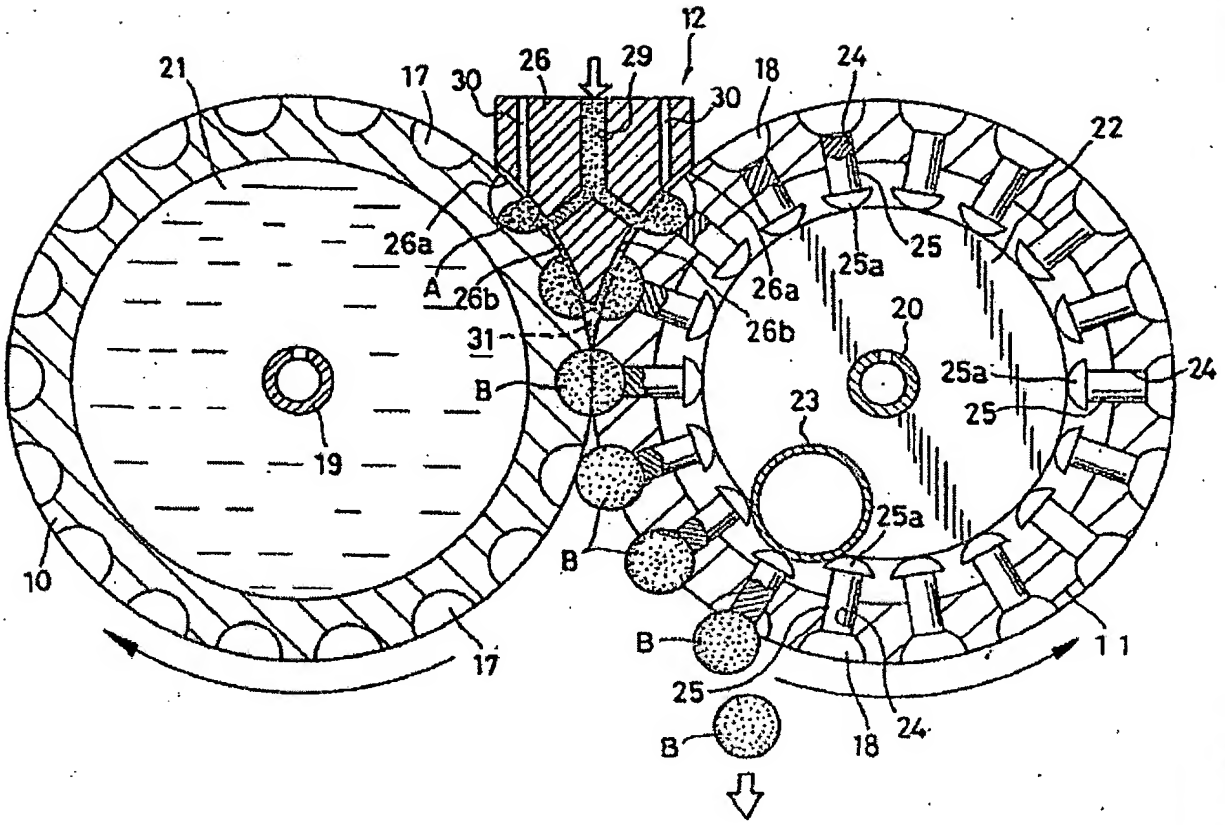

Figure 1

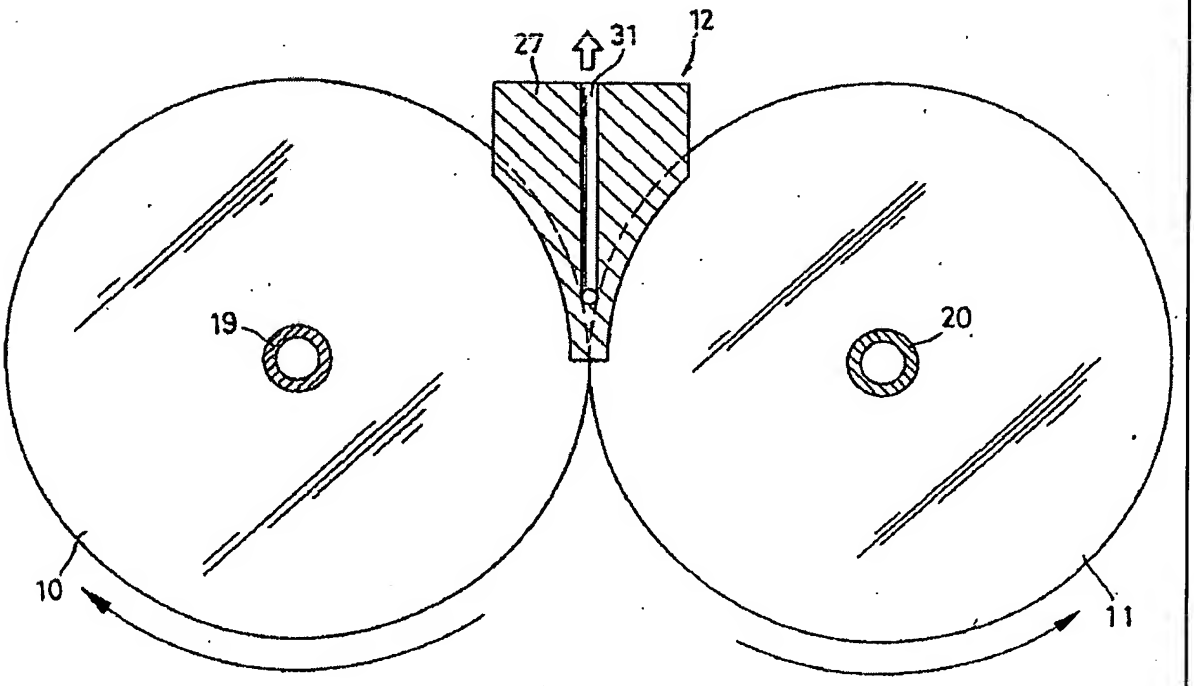

Figure 2